

**Official Program
of the
79th Annual Meeting**

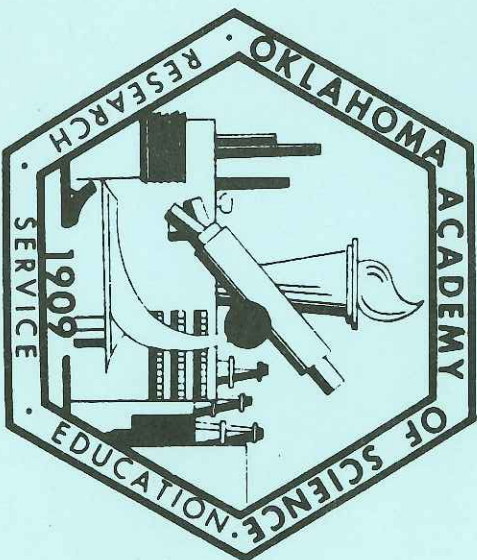
of the

OKLAHOMA

ACADEMY of SCIENCE

Affiliated with the

American Association for the Advancement of Science



**OKLAHOMA ACADEMY OF SCIENCE
OFFICE of EXECUTIVE SECRETARY-TREASURER
POST OFFICE BOX 4424
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**November 8 and 9, 1990
Oral Roberts University
Tulsa, Oklahoma
Official Program - \$1.00**

79TH ANNUAL TECHNICAL MEETING

OKLAHOMA ACADEMY OF SCIENCE

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FUTURE ANNUAL FALL MEETINGS

8 November 1991	Southeastern State University, Durant
13 November 1992	Oklahoma State University, Stillwater

OKLAHOMA ACADEMY OF SCIENCE

Established in 1909

The purpose of the Academy shall be to stimulate scientific research; to promote fraternal relationship among those engaged in scientific work in Oklahoma; to diffuse among the citizens of the State a knowledge of the various departments of science; and to investigate and make known the material, educational and other resources of the State.

From Article I, Section 2 of the Constitution

Activities of the Oklahoma Academy of Science

1. Publication of the *Proceedings and Annals of the Oklahoma Academy of Science and Transactions of the Oklahoma Junior Academy of Science.*
2. Host annual fall meeting for presentation of scientific papers.
3. Sponsor symposia on selected topics of vital interest to the State.
4. Arrange spring and fall field meetings in various State floral and faunal habitats.
5. Coordinate the Junior Academy of Science activities.
6. Supervise Collegiate Academy of Science activities.
7. Provide research grant funds for outstanding research proposals submitted by State secondary and undergraduate college students.
8. Provide science consultation services to governmental and private agencies.

OKLAHOMA ACADEMY OF SCIENCE PRESIDENTS

1910	H.L. Lane, OU	1950	Howard Taylor, OCW
1911	D.W. Ohern, OK City	1951	H.W. Larsh, OU
1912	S.W. Reeves, OU	1952	V.B. Monnett, OAMC
1913	C.W. Shannon, OU	1953	S.P. Massie, LU
1914	No meeting	1954	A.N. Murray, TU
1915	C.W. Shannon, OU	1955	R.E. Olson, OU
1916	C.N. Gould, OU	1956	A.M. Stebler, OAMC
1917	L.C. Rairford, Iowa State	1957	D.E. Howell, OAMC
1918	No meeting	1958	G.J. Goodman, OU
1919	No meeting	1959	Elmer Lucas, OU
1920	M.M. Wickham, Norman	1960	P.E. Smith, OURS
1921	A.F. Reiter, PU	1961	E.M. Hodnett, OSU
1922	J.B. Thoburn, OK City	1962	H.G. Barclay, TU
1923	R.O. Whitten, OAMC	1963	G.A. Moore, OSU
1924	S. Weidman, OU	1964	A.D. Buck, NOJC
1925	(Spring) C.E. Sanborn	1965	J.E. Webster, OSU
1925	(Fall) H.L. Dodge, OU	1966	C.R. Williams, PU
1926	J.H. Cloud, OAMC	1967	C.D. Riggs, OU
1927	C.N. Gould, OU	1968	E.A. Reynolds, SWSC
1928	O.M. Smith, OAMC	1969	L.V. Scott, OUHSC
1929	A. Richards, OU	1970	C.C. Carpenter, OU
1930	Leroy Long, OK City	1971	Paul Buck, TU
1931	A.O. Weese, OU	1972	W.A. Carter, ECSU
1932	Herbert Patterson, OAMC	1973	C.J. Markin, OU
1933	J.E. Knowles, PU	1974	N.N. Durham, OSU
1934	F.G. Brooks, OCU	1975	Barbara Shirley, TU
1935	C.E. Decker, OU	1976	G.W. Todd, OSU
1936	H.J. Harper, OAMC	1977	D.E. Kizer, Noble Foundation
1937	B.D. Barclay, TU	1978	George Odell, OSU
1938	C.M. Perry, OU	1979	Richard Couch, ORU
1939	H.D. Chase, TU	1980	Garry Wolgamott, SWSU
1940	G.L. Cross, OU	1981	Elroy Rice, OU
1941	R.W. Jones, OAMC	1982	Everett Grigsby, NEU
1942	H.I. Featherly, OAMC	1983	Jack Sokatch, OUHSC
1943	O.F. Evans, OU	1984	Mary Whitmore, OU
1944	V.G. Heller, OAMC	1985	Jeff Black, OBU
1945	J.R. Nielsen, OU	1986	Jerry Wilhm, OSU
1946	O.C. Dermer, OAMC	1987	Manford K. Patterson, Noble Foundation
1947	J.T. Self, OU	1988	Mary P. Carpenter, OU
1948	L.S. McLeod, TU	1989-1990	
1949	J.C. Shirley, PU		Kenneth E. Conway, OSU

79TH ANNUAL FALL TECHNICAL MEETING OKLAHOMA ACADEMY OF SCIENCE

Program Summary

Thursday, 8 November 1990

6:30 p.m.

Executive Council Dinner and Meeting, Grandview Hotel, 7900 South Lewis, on west side of Lewis, directly across from Oral Roberts University

Friday, 9 November 1990

7:30 a.m. - 3:00 p.m. Registration for Technical Meeting, Main Lobby of Learning Resources Center

7:30 a.m. - 11:00 a.m. Registration for Junior Academy Research Workshop, Student Activities Center

8:00 a.m. - 11:15 a.m. Concurrent Scientific Sessions

11:15 a.m. - 12:00 noon OAS Annual Business Meeting, Learning Resources Center, Room 235. All OAS members are encouraged to attend.

12:00 noon - 1:15 p.m. OAS Banquet, Mabee Center Mezzanine.

Speaker: Dr. Charles J. Scifres, Associate Director, Agricultural Experiment Station, OSU. Title: Science and Agriculture
Presentation of 1990 OAS Meritorious Service to Science in Oklahoma

Awards:

Individual: Dr. M.K. Patterson, Jr., Samuel Roberts Noble Foundation, Ardmore

Organization: George Miksch Sutton Avian Center, Bartlesville

1:30 p.m. - 5:00 p.m. Concurrent Scientific Sessions

ACADEMY NAME BADGES

An OAS name badge, obtained by registering, is required for all individuals attending Academy workshops, meetings and banquet. All presenters must register and wear badges.

MEETING ROOMS

The Oklahoma Junior Academy of Science Research workshop will be held in Zoppelt Auditorium in the Student Activities Center. All other OAS sessions, including the Posters, will be held on the second floor of the Learning Resources Center. The banquet will be on the Mezzanine level of Mabee Center. Any changes or special announcements will be posted in the Registration area.

GENERAL INFORMATION

Parking:

Refer to the campus map in the back of this program for parking locations on campus. More than adequate parking space is available on the south and west sides of Mabee Center.

Pre-Registration:

Individuals who have pre-registered can obtain their registration packets at the Registration Desk. The registration desk will be located in the Learning Resources Center (LRC) and will open at 7:30 a.m. on Friday.

On-Site Registration: On-site registration fees: OAS Members - \$ 15.00; Guests - \$ 17.50; Students - \$ 7.50; Banquet (if tickets available) - \$ 10.75.

1990 and 1991 Dues are Payable: The OAS registration desk will accept dues payments. Professional Dues - \$ 15.00; Student Dues - \$ 5.00; Family Memberships - \$ 20.00; Sustaining Memberships - \$ 100.00; Library Memberships - \$ 17.50; Lifetime Memberships - \$ 300.00.

Academy Business Meeting: The 79th Annual Business Meeting of the Oklahoma Academy of Science will be held in the Learning Resources Center, Room 235 (see program summary). All OAS members are encouraged to attend.

Academy and Award Banquet: The annual banquet will be held at noon Friday on the Mabee Center Mezzanine (enter on the north side). There will be a speaker and special awards presentation.

Guidelines for paper publication: Papers may be published in the Proceedings of the Oklahoma Academy of Science, subject to editorial policies (P.O.A.S., 69, 77-79, 1989) and review of the Editorial Board. Manuscripts (an original and two copies) should be mailed to: Professor Franklin R. Leach, Editor, P.O.A.S., Dept. of Biochemistry, Oklahoma State University, Stillwater, OK 74078. Manuscripts received after the 15th of December will be accepted for publication the following year. OAS members can expect an average charge of \$ 30.00 to \$ 35.00 per page.

Executive Secretary-Treasurer: Inquiries concerning the OAS should be directed to the Executive Secretary-Treasurer at P.O. Box 4424, Tulsa, OK 74159-0424.

Membership: Membership application forms will be available at the registration desk and/or by contacting the Executive Secretary-Treasurer at the above address. For your convenience a membership form is included in this program.

Refreshments: Coffee and donuts will be served in the registration area in the Learning Resources Center from 8:00 to 10:30 a.m. and 2:30 to 3:30 p.m. for OAS Technical meeting registrants. Refreshments for the OAS participants will be available in the OAS registration area in the Student Union Building.

Hotels:

The designated hotel for the OAS Technical Meeting is the Grandview which is located directly across South Lewis from Oral Roberts University. Rates are \$ 45.00 a night for one or two people in a room and \$ 5.00 per person for additional people in the room. For reservations call 1-800-444-7263 and inform the desk you will be attending the OAS meetings at ORU. The local phone number is 492-5000.

A second motel in the immediate vicinity of Oral Roberts

University is the University Inn at 8888 South Lewis. The rates are \$ 30.00 for a single and \$ 35.00 for a double. The phone number is 1-800-238-8648 and, once again, inform the desk you will be attending the OAS meeting at ORU.

Assistance or Information: Look for individuals with OAS staff badges. Persons wearing these badges are members of the Oral Roberts Community and will assist you in any way they can.

Name Badge: Name badges, provided upon registration, must be worn by all individuals attending Academy Sectional Scientific Sessions, the Business meeting and Banquet. Without a registration name badge you will be asked to leave. Should you lose your badge please see about a replacement at the registration desk.

Official Program: Bring this program with you. Additional copies will be available at the registration desk for \$ 1.00.

1991 Spring Field Meeting: The 1991 Spring Field Meeting is scheduled for the 19th - 21st April at Lake Murray State Park. Dr. Craig Clifford, Biology Department, Northwestern Oklahoma University, Tahlequah, OK 74464 is making arrangements for the meeting. Be certain to mark this date on your calendar and should you have any questions, ideas or suggestions feel perfectly free to contact Craig.

No Smoking: Please, no smoking in any of the buildings on campus. Thank you.

SECTION A: BIOLOGICAL SCIENCES

SUBSECTION I: BOTANY

LEARNING RESOURCES CENTER: Room 204B

MORNING SESSION: MODERATOR: PAUL NIGHS WONGER, NW OSU

- 8:45 a.m. Ultrastructural and physiological study of damage to *Sorghum bicolor* (L.) Moench caused by drought and *Schizaphis graminum* (Rondani). M. Hamissou, J.A. Webster, P.E. Richardson and G.W. Todd, OSU
- 9:00 a.m. Response of wheat growth and CO₂ assimilation to altering root-zone temperature. S.H. Al-Hamdani, G.W. Todd and D.A. Francko, OSU
- 9:15 a.m. Beneficial aspects of Mycorrhizal symbiosis on growth and development of the host plant. J. Montana, OSU
- 9:30 a.m. Survey and identification of the flower pigments in *Saindpaulia ionantha*. J.L. Smith, Oklahoma City Public Schools
- 9:45 a.m. Coffee Break
- 10:00 a.m. A genetic model for flower pigment inheritance in *Saindpaulia ionantha*. J.L. Smith, Oklahoma City Public Schools
- 10:15 a.m. Evidence for a metabolite from *Pythium myriophyllum* toxic to peanut seedlings. N.I. Khan, R.K. Soufi and A.B. Filonow, OSU
- 10:30 a.m. Influence of peanut roots and pods on fluctuations in *Pythium* spp. R.K. Soufi and A.B. Filonow, OSU
- 11:00 a.m. Biological Sciences Section Meeting, LRC 235
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabey Center Mezzanine

SECTION A: BIOLOGICAL SCIENCES

SUBSECTION I: BOTANY

LEARNING RESOURCES CENTER: Room 204B

AFTERNOON SESSION: MODERATOR: LARRY MAGRATH, USAO

- 1:45 p.m. Selection of *Trichoderma* spp. for use as biological control agents against soilborne pathogens. S.E. Thompson, OSU **Student Competition**

- 2:00 p.m. Can soil solarization control soilborne pathogens? K.E. Conway, OSU
- 2:15 p.m. The effects of grassland fragmentation on species richness and diversity. D. Zhang, R. Tyrl and R. Gillen, OSU
- 2:30 p.m. Floral inventory of Fort Sill, Oklahoma. R.A. Thompson, F.L. Johnson, R. Rudman, J.R. Estes and G.D. Schnell, Okla. Biological Survey and Bobb Herbarium, OU
- 2:45 p.m. Coffee Break
- 3:00 p.m. Sixty year study of pine-oak forest (*Pinus echinata*) in southeastern Oklahoma. E.L. Little, Jr., Arlington, Virginia
- 3:15 p.m. Vegetation of Ten Acre Rock. A. Eddy, McClelland High School

SECTION A: BIOLOGICAL SCIENCES SUBSECTION II: ZOOLOGY

LEARNING RESOURCES CENTER, Room 235

MORNING SESSION: MODERATOR: CRAIG CLIFFORD, NEO

- 9:00 a.m. "Love thy neighbor": Experimental evidence for the dear enemy phenomenon in territorial male collared lizards, *Crotaphytus collaris*. T. Baird and S. Fox, CSU
- 9:15 a.m. When it's not you're not: thermoregulatory precision in Andean lizards. S. Fox, OSU
- 9:30 a.m. Vertebrate prey of the loggerhead shrike in Oklahoma. J.D. Tyler, Cameron University
- 9:45 a.m. Coffee break
- 10:00 a.m. Evolutionary relationships of Death Valley pupfishes: Biochemical analysis. A. Echelle and A. Echelle, OSU
- 10:15 a.m. Reptile and amphibian species of Williams Scout Reservation in Major County, Oklahoma. D.L. Crosswhite, Phillips University
- 10:30 a.m. Swarming of paper wasp sexuels at towers (Hymenoptera: Vespidae). H. Reed and P. Landolt, ORU
- 10:45 a.m. Observations in the genetic inheritance of coat color in the Mongolian gerbil, *Meriones unguiculatus*. J.L. Smith, Oklahoma City Public Schools

- 11:00 a.m. Biological Sciences Section Business Meeting, LRC 235
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabae Center Mezzanine

SECTION A: BIOLOGICAL SCIENCES SUBSECTION II: ZOOLOGY

LEARNING RESOURCES CENTER: Room 235

AFTERNOON SESSION: MODERATOR: VERNON POWDERS, NWOSU

- 1:30 p.m. New range extension of the white sucker, *Catostomus commersoni* (Lacepede), into western Oklahoma. J. Pigg and R. Perham, Ok. State Dept. Health
- 1:45 p.m. Feeding kinematics of the rotifer *Brachionus plicatilis* and the brine shrimp *Artemia salina* fed different algae. I.C. Forley, ORU
Student Competition
- 2:00 p.m. *Brachionus plicatilis* (Rotifers) - various aspects of its feeding biology. I. Rejzby, ORU **Student Competition**
- 2:15 p.m. Comparison of feeding kinematics of *Artemia salina* at different age groups. E.J. Su, ORU **Student Competition**
- 2:30 p.m. Preliminary studies of the feeding kinematics and life history of *Artemia salina*. P. Bell, ORU **Student Competition**
- 2:45 p.m. Seasonal Progression of mandibular development in paper wasp males (Hymenoptera: Vespidae) A.S. Davis, ORU **Student Competition**

SECTION B: GEOLOGY
LEARNING RESOURCES CENTER: Room 218B
MORNING SESSION: MODERATOR: KENNETH JOHNSON,
Oklahoma Geological Survey

- 8:45 a.m. Hydrogeology of the Rush Springs-Marlow aquifer in the Anadarko basin of western Oklahoma. K.S. Johnson, Oklahoma Geological Survey
- 9:05 a.m. Environmental ground-water assessments related to waste-management activities. G.J. Hall, Corps of Engineers
- 9:25 a.m. Radon potential in Oklahoma. K.V. Luza, Oklahoma Geological Survey
- 9:45 a.m. Coffee Break
- 10:00 a.m. Coal geology of the northeastern Oklahoma shelf area. L.A. Hemish, Oklahoma Geological Survey
- 10:20 a.m. Earthquakes at New Madrid, Missouri, and their effects on Oklahoma. J.E. Lawson, Jr., Oklahoma Geological Survey
- 10:40 a.m. Important role of core-drilling data and subsurface reference logs in confirming stratigraphic relations and depositional environments from outcrop to subsurface for Pennsylvanian-Permian sequences in Oklahoma. J.R. Chaplin, Oklahoma Geological Survey
- 11:00 a.m. Geology Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabee Center Mezzanine

SECTION C: PHYSICAL SCIENCES
LEARNING RESOURCES CENTER: Room 218D
MORNING SESSION: MODERATOR: DONALD THOMPSON, OSU

- 10:30 a.m. Ambient Pressure Measurements of the Dielectric Properties of Several (PAQR) Polymers. N.A. Hlial and J.P. Wicksted, OSU
- 10:45 a.m. A Computer Controlled Solar Tracker; Phase II. J. Millard, Bartlesville High School
- 11:00 a.m. Physical Sciences Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabee Center Mezzanine

SECTION D: SOCIAL SCIENCES
LEARNING RESOURCES CENTER: Room 218B
MORNING SESSION: MODERATOR: JOHN J. BURKE, ECU

- 9:15 a.m. Reconciling economic and ecological policies: The Federal Reserve System as a model for an environmental agency. W. Focht, OSU
- 9:30 a.m. Behavioral treatment of aggression in developmentally disabled individuals in an institutional and community-based setting. R. Maxwell, ECU, D. Atwood, DHS and R. Wigdor, ECU.
- 9:45 a.m. Coffee Break
- 10:00 a.m. Implementation of the 193 Oklahoma State University Campus Master Plan. C.L. Leider, OSU
- 10:15 a.m. Minorities and medical education in the U.S.: 1968 - 1990. T.D. Watts, University of Texas at Arlington
- 10:30 a.m. Correlation between Factor 0 on the 16PF and the K scale on the MMPI. J.J. Burke, ECU
- 10:45 a.m. The relationship of creativity and hearing-impairment as compared to mathematical application skills. H.L. Mathis, Westmore High School
- 11:00 a.m. Social Sciences Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabee Center Mezzanine

SECTION E: SCIENCE EDUCATION
LEARNING RESOURCES CENTER: Room 218A
MORNING SESSION: MODERATOR: DAVID LOLLIS,
Midwest City Schools

- 10:30 a.m. Is there Life in 'Life Science'? D.L. Thurman, ORU
- 10:45 a.m. Organizing a Brief Marine Biology Field Trip. D. Lollis, Midwest City High School
- 11:00 a.m. Science Education Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabee Center Mezzanine

SECTION F: GEOGRAPHY

LEARNING RESOURCES CENTER: Room 218C

MORNING SESSION: MODERATOR: GREG PLUMB, OU

- 10:00 a.m. Diurnal variation of thunderstorm precipitation over the central plains.
C. Mayo, OU
- 10:15 a.m. A computer generated atlas of Oklahoma. T. Winkle, OSU
- 10:30 a.m. U.S. Census Bureau TIGER files: what they are all about. M. Warren,
Okla. Dept. of Commerce
- 10:45 a.m. The geographic displacement of cocaine activity in Tulsa. J. Deluca, OSU
- 11:00 a.m. Geography Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabae Center Mezzanine

SECTION F: GEOGRAPHY

LEARNING RESOURCES CENTER: Room 218C

AFTERNOON SESSION: MODERATOR: TOM WINKLE, OSU

- 1:45 p.m. A regional analysis of functional changes in Oklahoma small towns.
B. Schulz, OSU
- 2:00 p.m. Geographic variation of petroleum production, activity, and revenues in
Oklahoma. E. Pugh, OSU
- 2:15 p.m. Lichens and surface boulder weathering as relative age indicators for glacial
moraines in the Huerfano Valley of Colorado. J. Grimes, OU
- 2:30 p.m. Spatial and population change in the Springfield, Massachusetts, region:
1635 - 1880. L. Seig, OSU
- 2:45 p.m. Coffee Break
- 3:00 p.m. Climate model simulations of surface air temperature and the implications for
prognostications of O₂ warming. D. Legates, OU
- 3:15 p.m. What makes a fan a fan? ... An application of sports sociology. J. Easley, OSU
- 3:30 p.m. Use of animation in computer cartography. G. Plumb, OU

SECTION G: WILDLIFE CONSERVATION

LEARNING RESOURCES CENTER: Room 203

AFTERNOON SESSION: MODERATOR: GENE GILLILAND, ODWC

- 1:30 p.m. Assessing function of the reticuloendothelial system in wild cotton rats
(*Signatus hispidus*). S. McMurtry, R. Lochmiller and C. Qualls, OSU
- 1:45 p.m. Effect of sex, season, and nutritional condition on gastrointestinal length of white-
tailed deer. J. Jenks, D. Leslie, Jr., R. Lochmiller and M. Melchior, OSU
- 2:00 p.m. Use of Lowrance X-16 fish finder to estimate relative abundances of pelagic
fish (?). K. Sorenson and A. Zele, OSU and C. Stone, South Dakota Dept. Game,
Fish and Parks.
- 2:15 p.m. New records of introduced fish species in Oklahoma. J. Pigg, Oklahoma
State Department of Health
- 2:30 p.m. The effects of floodwater inundation on a small mammal community in south-
eastern Oklahoma. S. Sheffield, OSU
- 2:45 p.m. Coffee Break
- 3:00 p.m. Current status of the Arkansas River Shiner and potential factors affecting its
decline. R. Lerson, A. Echelle, A. Zele and G. Luttrell, OSU
- 3:15 p.m. Utilization and nutritional benefits of supplemental feed to bobwhite quail in
western Oklahoma. A. Peoples, R. Lochmiller, D. Leslie, Jr. and D. Engle, OSU
- 3:30 p.m. Effect of dietary protein restriction on immune function in bobwhite quail
(*Colinus virginianus*). M. Vestey, R. Lochmiller and J. Boren, OSU
- 3:45 p.m. Amino acid profiles of common bobwhite quail foods and their ability to meet
essential amino acid requirements. J. Boren, A. Peoples and R. Lochmiller, OSU
- 4:00 p.m. The status of black bears in southeastern Oklahoma. J. Whitaker, D. Kocka
and E. Stewart, ODWEC
- 4:15 p.m. Methods for transporting incubated giant Canada goose eggs from Cornwall,
Ontario to El Reno, Oklahoma. J. Aldrich, ODWC; B. Steele and S. Aubrey,
Ontario Min. Nat. Res.; and D. Dennis, Canadian Wildlife Service
- 4:30 p.m. Feeding strategies of the Ozark big-eared bat, *Plecotus townsendii ingens*, in
eastern Oklahoma. B. Clark, W. Drew, D. Leslie, Jr. and T. Carter, OSU
- 4:45 p.m. Temporal variation in the numbers of Ozark big-eared bats in eastern Oklahoma.
B. Clark, W. Puckette, D. Leslie, Jr. and T. Carter, OSU

SECTION G: WILDLIFE CONSERVATION
LEARNING RESOURCES CENTER: ROOM 203
MORNING SESSION: MODERATOR: JIM SCHOOLLEY, NEO

- 8:30 a.m. Preferences and opinions of Oklahoma anglers, 1990. G. Summers, ODWC
- 8:45 a.m. Up-date on roughed grouse introduction to Oklahoma's Ozark Uplife.
D. Hoar, ODWC
- 9:00 a.m. Wildlife deaths associated with open pits and tanks in Oklahoma. B. Germany, T. McKay, C. Schreifer, USFWS and R. Suttles and C. Shultz, ODWC
- 9:30 a.m. Results of a water level management plan on largemouth bass recruitment in Eufaula Reservoir, Oklahoma. G. Wright, ODWC
- 9:45 a.m. Coffee Break
- 10:00 a.m. Status of the red-cockaded woodpecker in southeastern Oklahoma. J. Kelly, S. Pletschet and D. Leslie, Jr., OSU
- 10:15 a.m. Preliminary assessment of the influence of hydropower on the Kew tailwater recreational fishery. B. Bowles and A. Zale, OSU
- 10:30 a.m. Effects of essential amino acid nutrition on cottontail rabbit (*Sylvilagus floridanus*) populations. D. Peitz, D. Leslie, Jr., D. Engel and R. Lochmiller, OSU
- 11:45 a.m. Water quality factors affecting seasonal white bass abundances in the Pensacola dam tailwater, Oklahoma. T. Adornato and A. Zale, OSU
- 11:00 a.m. Wildlife Conservation Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabee Center Mezzanine

SECTION H: MICROBIOLOGY
LEARNING RESOURCES CENTER: ROOM 204B
MORNING SESSION: MODERATOR: RICHARD LEU, Samuel Roberts Noble Foundation

- 8:45 a.m. Protection of mice against infection with *Mycobacterium fortuiti*. D.T. John, OSU College of Osteopathic Medicine.
- 9:00 a.m. Development of a bioassay system to detect ammonia production by *Pseudomonas aeruginosa*, a potential biocontrol agent against soilborne plant pathogens. M. Bailly, K.E. Conway and M.A. Delgado, OSU
- 9:15 a.m. Complement subcomponent C₃ modulates macrophage activation for tumor cytotoxicity. R. Leu, The Samuel Roberts Noble Foundation.
- 9:30 a.m. Mineralization of m-cresol in a sulfate-reducing bacterial enrichment. K. Ramamand and J.M. Sufita, OUHSC
- 9:45 a.m. Coffee Break
- 10:15 a.m. A composite conjugative transposon in *Streptococcus*. M.N. Vijayakumar, OSU
- 10:30 a.m. Prevalence of antibodies to *Borrelia burgdorferi* in a selected Oklahoma County population. J.L. Turner, P. Guthrie and R. Ahmed, CSU
- 10:45 a.m. Genetic organization of the *Enterococcus faecalis* cytolysin operon and role of a cytolysin specific transport protein. R. Segarra and M.S. Gilmore, OUHSC.
- 11:00 a.m. Microbiology Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabee Center Mezzanine

SECTION H: MICROBIOLOGY
LEARNING RESOURCES CENTER: ROOM 204B
AFTERNOON SESSION: MODERATOR: M.S. GILMORE, OUHSC

- 2:00 p.m. A plasmid-encoded cytolytic toxin contributes to virulence in an *Enterococcus faecalis* endophthalmitis model. B. Jett and M.S. Gilmore, OUHSC

- 2:15 p.m. The effect of 5-azacytidine on myogenesis. J. Hanes, CSU
- 2:30 p.m. High efficiency introduction of plasmid DNA into glycine treated *Enterococcus faecalis* by electroporation. A.L. Cruz-Rodriguez and M.S. Gilmore, OUHSC
- 2:45 p.m. Isolation of iron reductase over-producing clones from Lambda gt11 Library of *Listeria monocytogenes* DNA. P. Wayne, ORU
- 3:00 p.m. AIDS in Uganda. J.K. Brockway, ORU ****Student Competition****

SECTION I: ENGINEERING SCIENCE

Learning Resources Center: Room 204F

Morning Session: Moderator: Anant R. Kukreti, OU

- 8:45 a.m. Development and Construction of a Cubical Device. D. K. Mishra, J. Thomas and J. Renfro (jointly presented by D.K. Mishra and J. Renfro), OU
- 9:00 a.m. Non-Linear Structural Analysis by Finite Element Method. M. Ghassamieh and A. R. Kukreti (M. Ghassamieh presenter), OU
- 9:15 a.m. Selenium Speciation in Oklahoma Ground Water and Soils. D. Maggon, A. Atalay, and K. Koll (D. Maggon presenter), OU
- 9:30 a.m. A Neural Net Architecture With Low Training Cycles for Rule-Based Expert Systems. J. Joseph and R. Sing, OU
- 9:45 a.m. Coffee Break
- 10:00 a.m. An Anisotropic Constitutive Model for Concrete and Rocks. M. Zaman, A.R. Kukreti and Y. Nejjar (M.M. Zaman presenter), OU
- 10:15 a.m. Dynamic Analysis of Concrete Pavements Resting on Vlasov Foundation. A. Alveppilly, M. R. Taheri and M. Zaman (A. Alveppilly presenter), OU
- 10:30 a.m. Neutralizing Acidic Mine Waters. S. Chaluvadi and A. Atalay (S. Chaluvadi presenter), OU
- 10:45 a.m. Ferrrous Metal Fires. D. Varshney, J. Francis and S. Gollanalli (D. Varshney presenter), OU
- 11:00 a.m. Engineering Science Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabey Center Mezzanine

SECTION I: ENGINEERING SCIENCE

LEARNING RESOURCES CENTER: Room 204F

AFTERNOON SESSION: MODERATOR: MICHAEL R. TAHERI, OU

- 1:30 p.m. Three Dimensional Testing of Plain and Fiber Reinforced Concrete. A. R. Kukreti, D. K. Mishra and M. Zaman (D. Mishra presenter), OU
- 1:45 p.m. Analysis of Stiffened Plates. E. Cheraghi and A.R. Kukreti (E. Cheraghi presenter), OU
- 2:00 p.m. Water Use Optimization at a Dairy Plant. E. Arquiga, OU
- 2:15 p.m. Application of Constitutive Modeling in Underground Mining. M.M. Zaman, A.R. Kukreti and D. Chen (D. Chen presenter), OU
- 2:30 p.m. Finite Element Analysis of Concrete Pavements Subjected to a Moving Vehicle and Considering Warping Due to Temperature. R. Khoda, M. Taheri and M. Zaman (R. Khoda presenter), OU
- 2:45 p.m. Coffee Break
- 3:00 p.m. Health Impact Considerations in Environmental Impact Statements. M. Arquiga and L. Canter (M. Arquiga presenter), OU
- 3:15 p.m. Development of Differential Quadrature Method for Fundamental Frequency Analysis of Tapered Plates. J. Farso and A. R. Kukreti (J. Farso presenter), OU
- 3:30 p.m. Environmental Impact Assessment of Selenium from Coal Mine Spoils. H. Zhang, A. Atalay and K. Koll (H. Zhang presenter), OU
- 3:45 p.m. Parametric Study to Predict the Pore-Pressure Response Due to Pile Driving. M. Hossain and S. Chandra (M. Hossain presenter), OU

SECTION J: BIOCHEMISTRY/BIOPHYSICS
LEARNING RESOURCES CENTER: Room 204C
MORNING SESSION A: MODERATOR: WILLIAM ORTIZ, OU

- 8:30 a.m. Tumor screening: Technique for rapid detection of point mutations. L. Whetzell, D. Ringer and F. Schaefer, Children's Medical Center, Tulsa
- 8:45 a.m. Rapid site-specific detection of the F508 CF microdeletion. F. Schaefer and L. Whetzell, Children's Medical Center, Tulsa
- 9:00 a.m. Rat brain transglutaminase binds calmodulin. V. Takeuchi, P.J. Bircckbichler, M.K. Patterson, Jr., K.N. Lee, Samuel Roberts Noble Foundation
- 9:15 a.m. Temperature-induced "bleaching" in cycloheximide-treated *Euglena gracilis*. W. Ortiz and M.S. Küther, OU
- 9:30 a.m. Primary characterization of clathrin coated vesicles from peas (*Pisum sativum* L.). H-B. Lin, S.M. Harley and L. Beavers, OU
- 9:45 a.m. Coffee Break

MORNING SESSION B: MODERATOR: PAUL BIRCKBICHLER,
Samuel Roberts Noble Foundation

- 10:00 a.m. Nitrate-induced polypeptides in membranes from corn seedling roots. M. Ni and L. Beavers, OU
- 10:15 a.m. Comparison of native and recombinant firefly luciferase. S. Ford, M. Hall and F. Leach, OSU
- 10:30 a.m. Cloning and expression of *Bruceella abortus cyt*, *wre*, and *recA* genes in *E. coli*. K. Nida and R. Essenberg, OSU
- 10:45 a.m. Expression of human transglutaminase in *E. coli*: Amino-terminal blocking has no critical role in the catalytic function. K.N. Lee, P.J. Bircckbichler, K.M. Hall, T. Suedhoff, M.D. Maxwell, H.A. Carter and M.K. Patterson, Jr., Samuel Roberts Noble Foundation.
- 11:00 a.m. Biochemistry/Biophysics Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabee Center Mezzanine

SECTION J: BIOCHEMISTRY/BIOPHYSICS
LEARNING RESOURCES CENTER: Room 204C
AFTERNOON SESSION: MODERATOR: FRED SCHAEFER,
Children's Medical Center, Tulsa

- 1:30 p.m. Biosynthesis of sesquiterpenoid phytoalexins in cotton cotyledons. G. Devita-Huerta, G.D. Davis and M. Essenberg, OSU
- 1:45 p.m. Applications of advanced PCR technology: Multiplexing, RFLP analysis and fetal sexing. J. Pritchard, K. Jones and N. Carpenter, Children's Medical Center, Tulsa
- 2:00 p.m. Linkage analysis in 26 families with fragile X syndrome. N.J. Carpenter, G.A. Rhein and T. Lam, Children's Medical Center, Tulsa
- 2:15 p.m. Composition of the essential oil from Devil's claw (*Proboscidea louisianica* (Marryniaceae)) plant. G.R. Waller, M.S. Riffle, D.S. Murey and R.P. Sgaranello, OSU
- 2:30 p.m. The effect of fish oil on liver phospholipids in rats. M. Arbuckle, Putnam City High School

POSTER SESSION: Authors will be present at their posters
(from 2:30 to 3:30 p.m.)

- 2:30 p.m. Characteristics of the interaction of the heme-regulated eIF-2 α kinase with the 90 kD heat shock protein and its associated proteins in rabbit reticulocyte lysates. Z. Xu and R. Matts, OSU
- 2:30 p.m. Comparison of proton translocation activities of cytochrome bc₁ complexes from beef heart mitochondria, *Rhodobacter sphaeroides* and *Rhodospirillum rubrum*. Z-H. Qiu and C-A. Yu, OSU
- 2:30 p.m. The catalytic role of subunit IV of the cytochrome b₆-f complex from spinach chloroplast. Y-P. Zou and C-A. Yu, OSU
- 2:30 p.m. Analytical approaches to studying the possible role of pectin degradation products in the resistance response of cotton to the bacterial blight pathogen. E. Miranda, M.L. Pierce and M. Essenberg, OSU

SECTION K: ELECTRON MICROSCOPY
LEARNING RESOURCES CENTER: Room 204G
MORNING SESSION: MODERATOR: KATHY KOCAN, OSU

- 8:45 a.m. The Electron Microprobe: An "Inside Look" at the Technology and Some of its Applications. Benjamin N. Powell, Phillips Petroleum.
- 9:30 a.m. Coffee Break
- 9:45 a.m. Systemic Implications of Structural Variations within "Anthemoid" Pollen - an SEM Study of Freeze-sectioned Pollen Grains. E.L. Vezey, J.J. Skvarla, L.E. Watson and J.R. Estes, OU ****Student Competition****
- 10:00 a.m. Application of Sequential Light and Scanning Electron Microscopy (LM and SEM) of a Single Tissue Section of the Study of Greenbug Aphid Damage in Wheat Leaves. J.H. Leford and P.E. Richardson, OSU ****Student Competition****
- 10:15 a.m. Pathogenesis of Myonecrosis Induced by a Toxin Isolated for *Agkistraden canitorix helveticus* (Broad-banded Copperhead) Venom. E.K. Johnson and C.L. Ownby, OSU ****Student Competition****
- 10:30 a.m. Sperm Cells in the Pollen Tubes of *Nicotiana*. H. Yu and S.D. Russell, OU ****Student Competition****
- 10:45 a.m. Cytoskeletal Organization and Modification in the Process of Fertilization of *Plumbago zeylanica*. B. Huang and S.D. Russell, OU ****Student Competition****
- 11:00 a.m. Electron Microscopy Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabey Center Mezzanine

SECTION K: ELECTRON MICROSCOPY
LEARNING RESOURCES CENTER: Room 204G
AFTERNOON SESSION: MODERATOR: JOE WOOD, OUHSC

- 2:00 p.m. An Electron Microscopist's Image of China. J.J. Skvarla and W.F. Chissoe, OU.
- 2:45 p.m. Coffee Break

- 3:00 p.m. Cytochalasin D Treatment of WISH Cells. A Scanning Electron Microscopy and Immunofluorescent Study of Microfilaments and Their Relationship to Cell Topography. A. Trent and W.D. Meek, College of Osteopathic Medicine, OSU
- 3:15 p.m. Fine Structure of the Human Synovial Membrane: A Comparison of the Cell Types and Junctions in Rheumatoid Arthritis (RA) and Degenerative Joint Disease (DJD). K.T. Fisher and W.D. Meek, College of Osteopathic Medicine, OSU
- 3:30 p.m. Development of *Anaplasma ovis* in Male *Dermacentor Andersoni* Ticks that were Transferred from Infected to Susceptible Sheep. K.M. Kocan, OSU, and D. Stiller, University of Idaho
- 3:45 p.m. Effects of the Calcium Ionophore A23187 on Development of *Anaplasma marginale* in Short Term Bovine Erythrocyte Cultures. E.F. Blouin, K.M. Kocan J.T. Blankmeyer, S.A. Ewing and S.J. Barton, OSU
- 4:00 p.m. Mounting Pollen Grains for Scanning Electron Microscopy (SEM) on Thermoplastic Adhesive. W.F. Chissoe and J.J. Skvarla, OU

**SECTION L: MATHEMATICS, COMPUTER SCIENCE
AND STATISTICS**
LEARNING RESOURCES CENTER: Room 232A
MORNING SESSION: MODERATOR: ANITA M. WALKER, ECU

- 8:00 a.m. Co-Op Education IBM-Style. E. Laird, ECU ****Student Competition****
- 8:15 a.m. The Methodology of Vote Counting. C. Carvejel, ECU ****Student Competition****
- 8:30 a.m. A Comparison of Sorters. T. Nichols and V. Counts, ECU
****Student Competition****
- 8:45 a.m. Coffee Break
- 9:00 a.m. Puzzle Solution Using State Space Search. A. Filas, ECU
****Student Competition****
- 9:15 a.m. Cracking UNIX Passwords. H. Olenn, ECU ****Student Competition****
- 9:30 a.m. Memory Resident Programming on the IBM PC. B. Ridgway, ECU
****Student Competition****
- 9:45 a.m. Coffee Break
- 10:00 a.m. Immediate Recurrence Array Reference Elimination. G.E. Hedrick and J. Asuru, OSU
- 10:15 a.m. Source to Source Translation: What Are the Gatcha's? J. McGrew, ECU
- 10:30 a.m. A Toe Dip Into Artificial Neural Networks. J.S. Meyer, St. Gregory's College
- 10:45 a.m. Zero-One Circulant Matrices With Row Sum N-1 and N-2. D. Woods, CSU
- 11:00 a.m. Mathematics, Computer Science and Statistics Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabae Center Mezzanine

SECTION M: ENVIRONMENTAL SCIENCE
LEARNING RESOURCES CENTER: Room 204D
MORNING SESSION: MODERATOR: JERRY WILHEM, OSU

- 8:30 a.m. Past, Present, and Future Trend in Physio-Chemical Measurements of Illinois River-Lake Tenkiller Water Quality. S. Burks, D. Gade and J. Wilhm, OSU
- 8:50 a.m. Algae of the Illinois River. D. Franco and J. Wilhm, OSU
- 9:10 a.m. Fishes of the Illinois River. J. Wilhm, OSU
- 9:30 a.m. Benthic Macroinvertebrates of the Illinois River. J. Wilhm, OSU
- 9:45 a.m. Coffee Break
- 10:00 a.m. Chromosome damage in Wild Rodents Inhabiting a Site Contaminated with Arcelor 1254. K. McBee and P. Shaw-Allen, OSU
- 10:15 a.m. Binding to Humic Acid Reduces the Bioavailability of Hydrophobic Organic Contaminants to Rainbow Trout (*Oncorhynchus mykiss*). M. Black and J. McCarthy, OSU
- 10:30 a.m. Carcinogen Induced Alterations in Salmonid Behavior. G. Ostrander, OSU
- 10:45 a.m. Miniaturizing Laboratory Instruments for Field Assays. J. Blankemeyer, OSU
- 11:00 a.m. Environmental Science Section Business Meeting
- 11:15 a.m. OAS Annual Business Meeting, LRC 235
- 12:00 noon OAS Banquet, Mabae Center Mezzanine

SECTION M: ENVIRONMENTAL SCIENCE
LEARNING RESOURCES CENTER: Room 204D
AFTERNOON SESSION: MODERATOR: STERLING BURKS, OSU

- 1:45 p.m. Development and Evaluation of a Portable Flourimeter used for Calibrating Remote Sensing Estimates of Chlorophyll Density. N. Jobe, S. Burks and J. Blankemeyer, OSU
- 2:00 p.m. Application of Phosphorus Loading Models to an Offset Reservoir. D. Toeltz, OSU

- 2:15 p.m. Quick and Dirty Bathymetric Mapping. M. Hutcheson and S. Brown, Okla. Water Resources Board
- 2:30 p.m. Geochemistry of Groundwater in the Alluvium and Terrace Deposits of the Fred Creek Aquifer, Tulsa, Oklahoma. S. Herr, H. Bruckner and G. Powers, ORU
- 2:45 p.m. Coffee Break
- 3:00 p.m. Evaluation of the Toxicity of Oil Refinery Effluents Using Methanol Fractionation. T. Johnson and S. Burks, OSU
- 3:15 p.m. Changes in the Fish Assemblages of Cow Creek, a Polluted Stream, as the Water Quality Improves. J. Pigg and R. Parham, Okla. State Department of Health

SECTION 2: OKLAHOMA JUNIOR ACADEMY OF SCIENCE ZOPPELT AUDITORIUM: STUDENT ACTIVITIES CENTER

RESEARCH WORKSHOP FOR SCIENCE TEACHERS AND HIGH SCHOOL STUDENTS

- 7:30 a.m. - 8:00 a.m. Registration and Refreshments: Lobby of Student Activities Center
- 8:00 a.m. - 8:15 a.m. Welcome: Jimmie Pigg, Director, Oklahoma Junior Academy of Science
- 8:15 a.m. - 9:10 a.m. The Use of Statistics in Your Research Paper. Drs. Bob Morrison and Bill Warde, Oklahoma State University
- 9:15 a.m. - 10:10 a.m. How to Get a Research Project Started. Dr. Bill Matthews, University of Oklahoma Biological Station
- 10:15 a.m. - 11:00 a.m. The Use of Photography in Your Research Project. Mr. Gaylord Younghein, State Arts Council, Oklahoma City
- 11:00 a.m. - 11:15 a.m. OJAS Meeting with students and teachers. Jimmie Pigg, Director, Oklahoma Junior Academy of Science
- 11:15 a.m. - 1:45 p.m. Lunch on your own. There is a cafeteria in the Student Activities Center and fast food outlets not far from campus.
- 1:45 p.m. - 5:00 p.m. Students and teachers are encouraged to attend OAS paper sessions. Check your program for titles of interest.
- Be courteous to the speakers. Make an effort to enter and leave the rooms between presentations.

OKLAHOMA JUNIOR ACADEMY OF SCIENCE **1990-91 Calendar**

Jimmie Pigg, Director: State Department of Health, State Water Quality Laboratory,
1000 NE 10th Street, P.O. Box 53551, Oklahoma City, Oklahoma 73152
Phone: Office: (405) 271-5240 or Home: (405) 799-8282.

OJAS REGIONAL MEETINGS

- Ada** - East Central University, 74820. Dr. Elmer Brown, (405) 332-8000, 497.
Dr. John Noble, (405) 332-8000, 498. 22 February 1991.
- Alva** - Northwestern Oklahoma State University, 73717. Dr. Paul Nightswonger,
(405) 327-1700. Dr. Vernon Powders, (405) 327-1700. 19 March
1991.
- Bartlesville** - Bartlesville Wesleyan, 74006. David McIntosh, (918) 333-6251. Dr. Don
Mosher, (918) 333-6151, 252. 9 February 1991.
- Bethany** - Southern Nazarene University, 6729 N.W. 39th Expressway, Bethany, 73008.
Dr. Leo Finkenbinder, (405) 789-6400, 6640. Dr. Sharon Young, (405)
7789-6400, 6642. 1 March 1991.
- Durant** - Southeastern Oklahoma State University, 74701. Dr. Sam Bigham, (405)
924-0121, 338. Dr. Connie Taylor, (405) 924-0121, 209. 1 March
1991.
- Edmond** - Central State University, 73034. Mrs. Cynthia B. Coleman, (405)
341-2980, 5435. 7 March 1991.
- Goodwell** - Panhandle State University, 73939. Dr. Kurt Schaefer, (405) 349-2611,
359. Dr. William Jones, (405) 349-2611, 301. 1 March 1991.
- Lawton** - Cameron University, 73505. Dr. Mickey Cooper, (405) 581-2374. Dr.
Bob Vowell, (405) 581-2308. 8 March 1991.
- Miami** - Northeastern Oklahoma A & M College, 74354. Dr. Mark Grigsby, (918)
542-8441, 316. Don Caskey, (918) 542-8441, 310. 14 March 1991.
- Tahlequah** - Northeastern Oklahoma State University, 74464. Dr. Craig Clifford, (918)
456-5511, 3827. Dr. Everett Grigsby, (918) 456-5511, 3046.
1 March 1991.
- Tulsa** - Oral Roberts University, 7777 S. Lewis, 74171. Dr. John Nelson, (918)
495-6931. Dr. John Korstad, (918) 495-6942. 1 March 1991.
- Weatherford** - Southwestern Oklahoma State University, 73096. Dr. Talbert Brown, (405)
774-3118. 1 March 1991.

Willburton - Eastern Oklahoma State College, 74578. Bill Albright, (918) 465-2361,
250. Maurice Hawthorne, (918) 465-2361, 246. 5-6 March 1991.

Papers should be received by the regional Director ten (10) days before the date of the
meeting. See **Special Instructions for OJAS Participants** for more information on
papers.

A student can enter his/her research paper but once at a regional contest of choice. **No
student may enter a research paper at more than one regional contest.** A
student paper rejected for state competition at regional level cannot enter a second
regional competition.

Ada - State Meeting Director, Dr. Don J. Noble, East Central Oklahoma State University,
74820. (405) 332-8000, 498. 4, 5, 6 April 1991.

IMPORTANT: Three copies of each regionally approved paper must be received by
Dr. Don J. Noble, OJAS State Contest Director no later than Friday 25 March
1991.

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Section M: Environmental Sciences	
Chair:	Jerry Wilhm, O.S.U.
Vice-Chair:	David G. Jennings, Okla., Dept. Pollution Control

OKLAHOMA ACADEMY OF SCIENCE COMMITTEES 1990

- 1. GENERAL ARRANGEMENTS**
 - Spring Field Meeting, 1990
 - Fall Field Meeting, 1990
 - Fall Technical Meeting, 1990
 - Collegiate Academy, 1990
 - Junior Academy, 1990
 - Spring Field Meeting, 1991
 - Fall Field Meeting, 1991
 - Fall Technical Meeting, 1991
- 2. Archives Committee**
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 - L. Vernon Scott
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 - Franklin R. Leach, O.S.U.
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 - Mary Carpenter, Chair
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- 13. Long Range Planning Committee**
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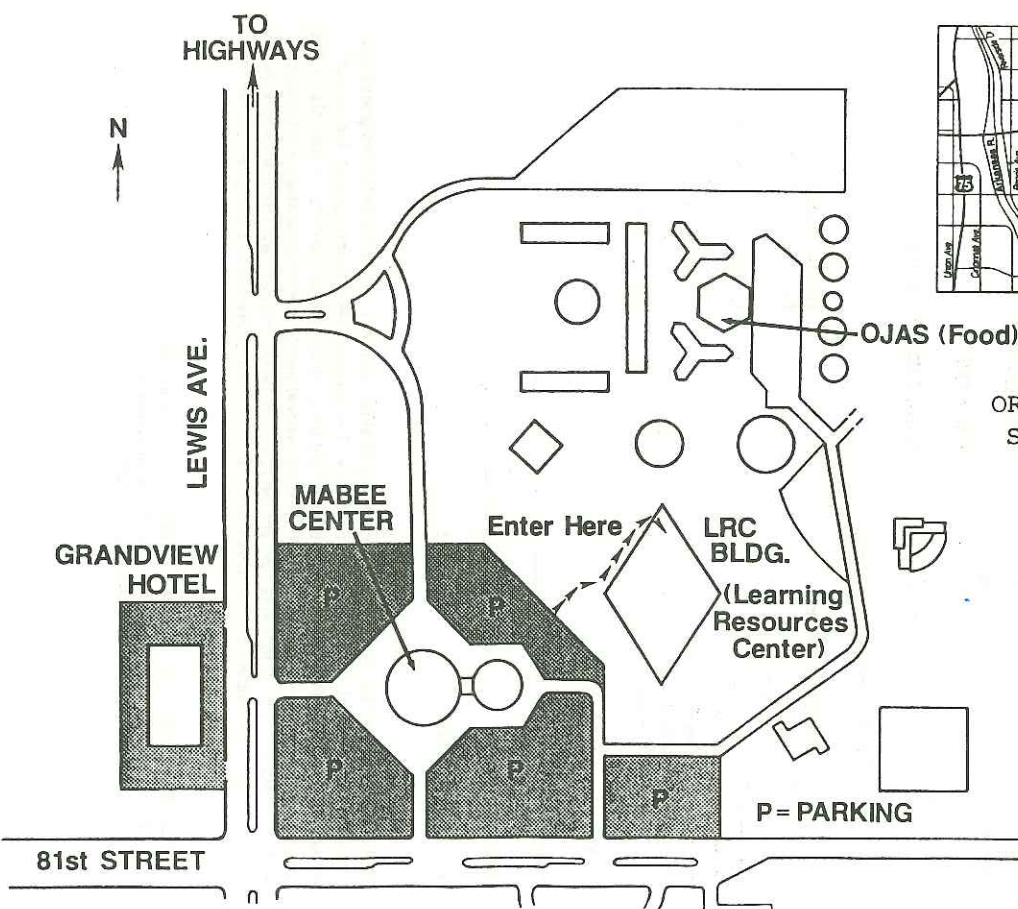
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Central State University	Terry Harrison
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South Lewis and East 81st

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THE OKLAHOMA ACADEMY OF SCIENCE

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MEMBERSHIP RENEWAL ...

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A	Biological Sciences	I	Engineering Sciences
B	Geology	J	Biochemistry/Biophysics
C	Physical Science	K	Electron Microscopy
D	Social Sciences	L	Mathematics, Computer Science
E	Science Education		and Statistics
F	Geography	M	Environmental Science
G	Wildlife Conservation	Y	Collegiate Academy
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 Index \$
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